

Muons in the cathedral

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by Elena Guardincerri

For traditional Christian architecture, the dome of a Renaissance cathedral represents Heaven. There is poetic symmetry today in using muons, the daughter particles of cosmic rays raining down from the stars, to scan the internal structure of a cupola atop a nearly 600-year-old Italian church in hopes of preserving it for centuries to come.

The lovely self-supporting dome of the Cathedral of Santa Maria del Fiore in Florence, Italy, was engineered by Filippo Brunelleschi, who figured out how to construct it from bricks and other masonry materials. Often called Brunelleschi's Dome and completed in 1436, it's actually two domes, one inside the other like Russian dolls.

In 2013, a group of experts on the cathedral came to Los Alamos National Laboratory to consult about fixing the cracks. That conversation led to bringing in muon-imaging technology as a tool to study the problem. Muon-imaging technology was developed for national security purposes, such as searching cargo shipments for nuclear materials — not quite cathedrals. As such, it would have to be adapted to prove useful in this unique architectural setting.

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